

<b>Notice of Allowability</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/822,630	HITZ ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Luke S. Wassum	2167	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to application filed 12 April 2004.
2. ☒ The allowed claim(s) is/are 3-26.
3. ☒ The drawings filed on 12 April 2004 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).


\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

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|---|---|
| <ol style="list-style-type: none"> <li>1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)</li> <li>2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)</li> <li>3. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),<br/>Paper No./Mail Date <u>24 August 2004</u></li> <li>4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br/>of Biological Material</li> </ol> | <ol style="list-style-type: none"> <li>5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)</li> <li>6. <input type="checkbox"/> Interview Summary (PTO-413),<br/>Paper No./Mail Date _____</li> <li>7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment</li> <li>8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance</li> <li>9. <input type="checkbox"/> Other _____</li> </ol> |
|---|---|

  
 Luke S. Wassum  
 Primary Examiner  
 Art Unit 2167

## DETAILED ACTION

### *The Invention*

1. The present invention is directed to a method and system for maintaining a file system wherein membership in multiple concurrently existing file systems is possible for each block. Root inodes are stored on the disk and in core memory, each constituting a consistent state of the file system, and wherein some blocks in the storage system belong to both consistent states of the file system.

### *Priority*

2. This application claims priority under U.S.C. § 120, as a continuation of application serial number 09/954522, now U.S. Patent 6,721,764, filed 11 September 2001, which is a continuation of application serial number 09/153,094, now U.S. Patent 6,289,356, filed 14 September 1998, which is a continuation of application serial number 09/108,022, now U.S. Patent 5,963,962, filed 30 June 1998, which is a continuation of application serial number 08/454,921, now U.S. Patent 5,819,292, filed 31 May 1995, which is a continuation of application serial number 08/071,643, now abandoned, filed 3 June 1993.

## EXAMINER'S AMENDMENT

3. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Art Unit: 2167

Authorization for this examiner's amendment was given in a telephone interview with attorney Anatoly S. Weiser on 29 December 2004.

The application has been amended as follows:

In the Specification on page 7, line 19, please change "done" to -- clone --.

In claims 5, 13 and 21, please change "in-code" to -- incore --.

In claim 8, please change "snapshots" to -- snapshot --.

In claims 8, 10, 16, 18, 24 and 26, please change

"said file system share said blocks"

to

-- said file system share said first set of blocks --.

*Allowable Subject Matter*

4. Claims 3-26 are allowed.

5. The following is an examiner's statement of reasons for allowance:

The present invention is directed to a method and system for maintaining a file system in memory and on a storage system including one or more hard disks, including root inodes maintained on both the memory and the storage system, each of which points directly and indirectly to a set of blocks on said storage system and storing a consistent state of the file system, wherein some of the blocks are common to both consistent states of the file system.

The closest prior art of record, **Chutani et al.** ("The Episode File System") teaches a file system which implements filesets, logical file systems that represent connected subtrees and allowing for efficient replication and backup of the file system.

However, **Chutani et al.** fails to anticipate or render obvious the recited feature of maintaining on-disk and incore root inodes, each of which pointing directly and indirectly to blocks, some of the blocks being common between the on-disk and incore root inodes; wherein changes made to the file system are stored on blocks in memory buffers and not pointed to by said on-disk root inode, as in independent claims 3, 11 and 19.

These features, together with the other limitations of the independent claims are novel and non-obvious over the prior art of record. The dependent claims 4-10, 12-18 and 20-26 being definite, enabled by the specification, and further limiting to the independent claim, are also allowable.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### *Conclusion*

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

**Campbell** (U.S. Patent 5,182,805) teaches a method for determining a copy-on-write condition in a UNIX process.

**Pike et al.** (U.S. Patent 5,623,666) teaches an operating system which is particularly adapted to heterogeneous distributed systems.

**Ohran et al.** (U.S. Patent 5,649,152) teaches a method for providing a static snapshot of data stored on a mass storage system.

**Raz** (U.S. Patent 5,701,480) teaches a multi-version database wherein copies of prior committed versions (snapshots) are maintained for access by the read-only transactions.

**Hitz et al.** (U.S. Patent 5,819,292) teaches a method for maintaining consistent states in a file system.

**Bamford et al.** (U.S. Patent 5,873,098) teaches a method for determining whether a particular version of a data item is available for use in a transaction.

**Hitz et al.** (U.S. Patent 5,948,110) teaches a method for providing error correction for an array of disks using non-volatile random access memory.

**Hitz et al.** (U.S. Patent 5,963,962) teaches a method for keeping a file system in a consistent state.

**Hitz et al.** (U.S. Patent 6,038,570) teaches a method for integrating a file system with a RAID array.

**Hitz et al.** (U.S. Patent 6,138,126) teaches a method for allocating files in a file system integrated with a RAID array.

**Hitz et al.** (U.S. Patent 6,289,356) teaches a method for keeping a file system in a consistent state.

**Armangau** (U.S. Patent 6,434,681) teaches a snapshot copy facility for a data storage system permitting continued host read/write access.

**Hitz et al.** (U.S. Patent 6,480,969) teaches a method for providing parity in a RAID subsystem using non-volatile memory.

**Lewis et al.** (U.S. Patent 6,640,233) teaches a system that manages a file system through the use of a reservation operation.

**Hitz et al.** (U.S. Patent 6,721,764) teaches a system for keeping a file system in a consistent state.

**Hitz et al.** (U.S. Patent 6,751,637) teaches a method for integrating a file system with a RAID array that exports precise information about the arrangement of data blocks.

**Srinivasan et al.** (U.S. Patent 6,823,336) teaches a data storage system that receives sets of revisions such that each set of revisions changes the dataset from one consistent state to another.

**Lewis et al.** (U.S. Patent Application Publication 2002/0083037) teaches a method for creating a snapshot of a file system.

**Strassburg et al.** (U.S. Patent Application Publication 2004/0139125) teaches a computer system with read/write access to storage devices that creates a snapshot of a data volume at a point in time.

**Bach** ("The Design of the UNIX® Operating System") teaches technical details of the UNIX operating system, including those of the file system.

**Schwartz et al.** ("LFS – A Local File System for Multiprocessor NFS Network Servers") teaches the file system of a new NFS server, the Auspex NS 5000.

**Hitz et al.** ("File System Design for an NFS File Server Appliance") teaches the Write Anywhere File Layout (WAFL).

**Hitz et al.** ("Using UNIX as One Component of a Lightweight Distributed Kernel for Multiprocessor File Servers") teaches the development of a high performance NFS file server.

**Chutani et al.** ("The Episode File System") teaches the design of Episode™, a highly POSIX-compliant file system.

**Hitz** ("An NFS File Server Appliance") teaches the Network Appliance product FAServer.

**Hitz et al.** ("File System Design for an NFS File Server Appliance") teaches WAFL (Write Anywhere File Layout), which is a file system designed to work in an NFS appliance.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luke S. Wassum whose telephone number is 571-272-4119. The examiner can normally be reached on Monday-Friday 8:30-5:30, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E. Breene can be reached on 571-272-4107. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

In addition, INFORMAL or DRAFT communications may be faxed directly to the examiner at 571-273-4119.

Customer Service for Tech Center 2100 can be reached during regular business hours at (571) 272-2100, or fax (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Luke S. Wassum  
Primary Examiner  
Art Unit 2167